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EXAMINER	
WANG, TED M	

ART UNIT	PAPER NUMBER
2611	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/749,927	FRANCA-NETO, LUIZ M.	
	Examiner	Art Unit	
	Ted M. Wang	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 February 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3,5-18,20-22 and 24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *1-3 and 5-14* is/are allowed.

6)☒ Claim(s) *15-18,20-22 and 24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments, filed on 2/27/2008, with respect to the rejection(s) of claim(s) 1-3 and 6-14 under 35 USC 102(e) and 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn.

2. Applicant's arguments, filed on 2/27/2008, with respect to claims 15-18, 20-22 and 24 have been fully considered but they are not persuasive. The Examiner has thoroughly reviewed Applicants' arguments but firmly believes that the cited reference to reasonably and properly meet the claimed limitations.

Independent Claims 15, 20, 21 and 24

(1) Applicants' argument – "It can be seen from this excerpt that Darabi does not disclose in any way the feature "pre-distorting a quadrature amplitude modulation (QAM) signal included in the analog message signal to compensate non-linearity associated with the switching amplifier", as incorporated into amended claim 15. Also referring to Darabi, col. 10, lines 45-60, which explains Fig 2, element 56, it can be seen that element 56 of Fig. 2 is a low-pass filter. The Applicant cannot find any part of Darabi that teaches the function of Darabi's element 56 in Figure 2 to be "pre-distorting a quadrature amplitude modulation (QAM) signal included in the analog message signal to compensate non-linearity associated with the switching amplifier", as recited in amended claim 15. Applicant thus submits that Darabi does not disclose this incorporated feature of claim 15, and accordingly amended claim 15 is believed to be allowable.

Similarly, Applicant submits that Darabi does not disclose the feature "pre-distorting the OFDM signal included in the analog message signal to compensate non-linearity associated with the switching amplifier", as recited in amended claim 16. Applicant thus submits that Darabi does not disclose this incorporated feature of claim 16, and accordingly believes amended claim 16 is allowable. Therefore, Applicant respectfully requests the reconsideration of the rejection under 35 USC § 102(e), and allowance of claims 1, 2, 7, 8, 10, 12, 15 and 16. " as recited in page 9 of the remark, dated 2/27/2008.

Examiner's response –

It is known in the art that when an amplifier has non-linearity with high-frequency input, then the output signal maybe distorted. The distortion may be mitigated by using a low-pass filter (LPF) to filter or attenuate (i.e. pre-distort) the high frequency component of a signal before the signal is input to the amplifier. For example, US Patent No. 7,333,558 (Nemer et al.), used here not for rejection, shows a LPF in front of an amplifier for mitigating the non-linearity in the amplifier (45, 50 in Fig. 1 and col. 2, lines 54-56). The element 56 of Darabi, referred to in the rejection, is a low pass filter that operates as a predistorion filter to pre-distort the input signals, INI and INQ, by filtering out the high frequency components of the input signals before the input signals are sent to the amplifier. Further, Paragraph 34 of the instant application merely states that the QAM signal is pre-distorted to compensate non-linearity associated with the switching amplifier. The specification does not provide any detail how the QAM signal is

pre-distorted or how the non-linearity is compensated. The claimed limitation is thus subjected to broadest reasonable interpretation. Since the low-pass filter 56 of Darabi attenuates (i.e., pre-distorts) the high frequency component of a signal before the signal is input to the amplifier, which in turn mitigates possible non-linear distortion due to high frequency input, the LPF 56 reasonably meets the claimed limitation.

In addition, column 10, line 61 – column 11, line 2, of Darabi's reference further teaches that the complex mixers, 58, can be designed to meet a specified IIP3 (Input Intercept Point for the 3rd harmonic) for the maximum allowable spurs over the frequency spectrum of the communications standard since spurious transmissions in a direct conversion transmitter are generated mainly because of the nonlinearity of the complex mixers and the DC offsets at the input to the complex mixers. That is, the complex mixer, 58, in Fig.2 of Darabi's reference further compensates for spurs caused by the non-linearity associated with switching amplifier.

(2) Applicants' argument – "Regarding independent claims 15, 20, 21 and 24 and their dependent claims: As mentioned above, Darabi does not disclose the feature "pre-distorting a quadrature amplitude modulation (QAM) signal included in the analog message signal to compensate non-linearity associated with the switching amplifier", as incorporated in amended claim 15, and no other references remedies this defect of Darabi. Thus, even combined, the cited

references do not teach or suggest each and every feature of amended independent claim 15, and thus do not render amended independent claim 15 obvious. This argument also applies to amended independent claims 20, 21 and 24. Since the cited references do not render independent claims 15, 20, 21 and 24 obvious, the cited references do not render dependent claims 16-18 and 22 of these independent claims obvious either, because any claim depending from a nonobvious independent claim is also nonobvious. *See* M.P.E.P. § 2143.03." as recited in pages 10 and 11 of the remark, dated 2/27/2008.

Examiner's response – The Examiner's response has been addressed in the above paragraph (Examiner's response to Applicant's Argument 1).

Thus, for the explanation addressed in the above paragraph, the rejection under 35 U.S.C. 103(a) with Darabi's reference is adequate.

Claim Objections

3. Claims 21, 22 and 24 are objected to because of the following informalities:

- Claims 21 and 24, change "An article comprising a machine-accessible medium having associated information, wherein the information, when accessed, results in a machine" to --- An article comprising a computer readable medium having associated information executable by a computer, wherein the information, when executed, results in a computer ---, respectively.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 15 and 17, 18 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Darabi et al. (US 7,233,772).

- With regard claim 15, Darabi et al. discloses an apparatus, comprising:

  a modulator (Fig.2 element 58) having a clock input including a duty cycle (Fig.2 element 53 output to element 58 input) to be modulated by an analog message signal (Fig.2 element 206 and Fig.6), the modulator to provide a modulated carrier with a monotonically-increasing fundamental frequency component (Fig.2 element 58 output to element 60 input, where it is inherent that the modulator (mixer) output will contain a modulated carrier with a monotonically-increasing fundamental frequency component.) to a power amplifier (Fig.2 element 62); and

  pre-distorting (Fig.2 element 56) a quadrature amplitude modulation (QAM) signal (column 6 lines 47-67) included in the analog message signal (Fig.2 element 56, where the output signal of the element 56, LPF, are analog signals) to compensate non-linearity associated with the switching amplifier (This

is the property of the Darabi's modulator and switching power amplifier circuitries).

The further explanation of the inherent property of the output of a mixer/modulator is follows-

With RF input signal, $a1 = A*\cos\omega_1 t$, and

Lo input signal, $a3 = B*\cos\omega_2 t$, the possible mixer output is

$f(a1, a3) = a_{00} + a_{01}\cos(\omega_2 t) + a_{02}\cos(2\omega_2 t) + \ldots + a_{0N}\cos(N\omega_2 t) + a_{10}\cos(\omega_1 t) + a_{11}\cos(\omega_1 \pm \omega_2 t) + a_{12}\cos(\omega_1 \pm 2\omega_2 t) + \ldots + a_{1N}\cos(\omega_1 \pm N\omega_2 t) + \ldots + a_{20}\cos(2\omega_1 t) + a_{21}\cos(2\omega_1 \pm \omega_2 t) + a_{22}\cos(2\omega_1 \pm 2\omega_2 t) + \ldots + a_{2N}\cos(2\omega_1 \pm N\omega_2 t) + \ldots + a_{M0}\cos(M\omega_1 t) + a_{M1}\cos(M\omega_1 \pm \omega_2 t) + a_{M2}\cos(M\omega_1 \pm 2\omega_2 t) + \ldots + a_{MN}\cos(M\omega_1 \pm N\omega_2 t)$.

The monotonically-increasing fundamental frequency components of ω_1, i.e., --- $2\omega_1$, $3\omega_1$, …, $M\omega_1$---, are generated by the mixer and the monotonically-increasing fundamental frequency components of ω_2, i.e., 3--- $2\omega_2$, $3\omega_2$, …, $N\omega_2$---, are also generated by the mixer. Other frequency components generated by the mixer at all frequencies m*RF + n*LO with ($-M \le m \le M$, $-N \le n \le N$) are called intermodulation (IMT) components. Depending on the application, the desired frequency can be selected by proper filter circuitry. In a receiver, the mixer is used as a downconverter/demodulator to generate an IF output signal. In a transmitter, the mixer can be used as an upconverter/modulator to generate a RF signal and distribute to a power amplifier.

The examiner interprets the limitation of "the modulator to provide a modulated carrier with a monotonically-increasing fundamental frequency

component to a switching amplifier" as recited in claim 15, as meaning that the output signal of the modulator is unfiltered and directly connected to a switching amplifier.

The mixer/modulator inherently produces a modulated carrier with monotonically increasing fundamental component if the output of the mixer/modulator is unfiltered. Fig. 2 of Darabi shows that the output of the in-phase mixer 58 is unfiltered and directly connected to the amplifier 60. The in-phase mixer 58 output therefore inherently contains the intermodulation components (IMT, m*I (LPF 56 output) + n*ICLK, $-M \leq m \leq M$, $-N \leq n \leq N$) and a modulated carrier with a monotonically-increasing fundamental frequency components (f_{ICLK}, $2\ f_{ICLK}$, $3\ f_{ICLK}$, …, and $N\ f_{ICLK}$, *and* f_I, $2\ f_I$, $3\ f_I$, …, and $M\ f_I$). Similarly, the quadrature mixer 58 also produces a modulated carrier with monotonically increasing fundamental frequency components.

The further explanation of the property of Darabi's circuitry for compensating non-linearity associated with the switching amplifier with pre-distorting (Fig.2 element 56) a quadrature amplitude modulation (QAM) signal (column 6 lines 47-67) included in the analog message signal is follows-

It is known in the art that when an amplifier has non-linearity with high-frequency input, then the output signal maybe distorted. The distortion may be mitigated by using a low-pass filter (LPF) to filter or attenuate (i.e. pre-distort) the high

frequency component of a signal before the signal is input to the amplifier. For example, US Patent No. 7,333,558 (Nemer et al.), used here not for rejection, shows a LPF in front of an amplifier for mitigating the non-linearity in the amplifier (45, 50 in Fig. 1 and col. 2, lines 54-56). The element 56 of Darabi, referred to in the rejection, is a low pass filter that operates as a predistorion filter to pre-distort the input signals, INI and INQ, by filtering out the high frequency components of the input signals before the input signals are sent to the amplifier. Further, Paragraph 34 of the instant application merely states that the QAM signal is pre-distorted to compensate non-linearity associated with the switching amplifier. The specification does not provide any detail how the QAM signal is pre-distorted or how the non-linearity is compensated. The claimed limitation is thus subjected to broadest reasonable interpretation. Since the low-pass filter 56 of Darabi attenuates (i.e., pre-distorts) the high frequency component of a signal before the signal is input to the amplifier, which in turn mitigates possible non-linear distortion due to high frequency input, the LPF 56 reasonably meets the claimed limitation.

In addition, column 10, line 61 – column 11, line 2, of Darabi's reference further teaches that the complex mixers, 58, can be designed to meet a specified IIP3 (Input Intercept Point for the 3rd harmonic) for the maximum allowable spurs over the frequency spectrum of the communications standard since spurious transmissions in a direct conversion transmitter are generated mainly because of the nonlinearity of the complex mixers and the DC offsets at the input to the

complex mixers. That is, the complex mixer, 58, in Fig.2 of Darabi's reference further compensates for spurs caused by the non-linearity associated with switching amplifier.

Darabi et al. discloses all of the subject matter as described in the above paragraph except for specifically teaching the power amplifier is a switching amplifier.

However, Darabi et al. further teaches that the power amplifier could be a switching power amplifier (column 29 lines 1-16) in order to power down the power amplifier so that the power on chip could be saved. Therefore, It would have been obvious to one of ordinary skill in the art at the time of the invention was made to replace the PA 62 with a switching power amplifier (Fig.25 and 26) as taught by Darabi et al. so as to power down the power amplifier so that the power on chip could be saved.

- With regard claims 17 and 18, Darabi et al. further discloses wherein the amplitude of the analog message signal changes according to a multiple carrier communication technique with an orthogonal frequency division multiplexing (OFDM) processing (column 6 lines 47-67).
- With regard claim 20, which is a method claim related to claim 18, all limitation is contained in claim 18. The explanation of all the limitation is already addressed in the above paragraph.

6. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Darabi et al. (US 7,233,772) in view of O'Connor et al. (US 6,693,271).

- With regard claim 16, Darabi et al. discloses all of the subject matter as described in the above paragraph except for specifically teaching wherein the duty cycle is limited to less than about 50%

  However, O'Connor et al. teaches wherein the duty cycle is limited to less than about 50% (column 6 lines 43-67).

  It is desirable to have the duty cycle is limited to less than about 50%. The reason for this is that this signal is used to modulate the switching amplifier. By making the duty cycle substantially 50%, the active phases and the inactive phases of the switching amplifier will have the same duration. Consequently, the condition of zero average gain of the switching amplifier will be achieved when the amplifier gain during the active phase is equal in magnitude but opposite in sign to the amplifier gain during the inactive phases of the modulation. If some errors associated with signal phase shifts can be tolerated, the signal 123 can also be used to modulate the light source directly. Otherwise, as illustrated, the 50% duty cycle square wave modulation can be used to trigger a pulse of shorter duration than the active phase of the signal used to modulate the switching amplifier. As mentioned above the use of this secondary pulse generator permits the active phase of the light output to be constrained entirely to the active phase of the switching amplifier in the presence of amplifier induced phase shifts and prevents self-interference (column 6 line 53 – column 7 line 4). Therefore, It

would have been obvious to one of ordinary skill in the art at the time of the invention was made to include the duty cycle that is limited to less than about 50% as taught by O'Connor et al. into Darabi's RF clock circuitry (Fig.4 element 14) so as to prevents self-interference.

7. Claims 21 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Darabi et al. (US 7,233,772) in view of Langberg et al. (US 5,852,630).

- With regard claim 21, Darabi et al. discloses all of the subject matter as described in the above paragraph (claim 15 rejection) except for the method written by a software program embodied in a computer-readable medium.

However, Langberg et al. teaches that the method and apparatus for a transceiver warm start activation procedure with precoding can be implemented in software stored in a computer-readable medium. The computer-readable medium is an electronic, magnetic, optical, or other physical device or means that can be contain or store a computer program for use by or in connection with a computer-related system or method (column 3, lines 51-65). One skilled in the art would have clearly recognized that the method of "Darabi et al." would have been implemented in a software. The implemented software would perform same function of the hardware for less expense, adaptability, and flexibility. Therefore, it would have been obvious to have used the software in "Darabi et al." as taught by Langberg et al. in order to reduce cost and improve the adaptability and flexibility of the communication system.

- With regard claim 24, Darabi et al. discloses all of the subject matter as described in the above paragraph (claim 20 rejection) except for the method written by a software program embodied in a computer-readable medium.

  However, Langberg et al. teaches that the method and apparatus for a transceiver warm start activation procedure with precoding can be implemented in software stored in a computer-readable medium. The computer-readable medium is an electronic, magnetic, optical, or other physical device or means that can be contain or store a computer program for use by or in connection with a computer-related system or method (column 3, lines 51-65). One skilled in the art would have clearly recognized that the method of "Darabi et al." would have been implemented in a software. The implemented software would perform same function of the hardware for less expense, adaptability, and flexibility. Therefore, it would have been obvious to have used the software in "Darabi et al." as taught by Langberg et al. in order to reduce cost and improve the adaptability and flexibility of the communication system.

8. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Darabi et al. (US 7,233,772) in view of O'Connor et al. (US 6,693,271) as applied to claim 16 above, and further in view of Langberg et al. (US 5,852,630).

- With regard claim 22, Darabi et al. and O'Connor discloses all of the subject matter as described in the above paragraph (claim 16 rejection) except for the method written by a software program embodied in a computer-readable medium.

However, Langberg et al. teaches that the method and apparatus for a transceiver warm start activation procedure with precoding can be implemented in software stored in a computer-readable medium. The computer-readable medium is an electronic, magnetic, optical, or other physical device or means that can be contain or store a computer program for use by or in connection with a computer-related system or method (column 3, lines 51-65). One skilled in the art would have clearly recognized that the method of "Darabi et al. and O'Connor" would have been implemented in a software. The implemented software would perform same function of the hardware for less expense, adaptability, and flexibility. Therefore, it would have been obvious to have used the software in "Darabi et al. and O'Connor" as taught by Langberg et al. in order to reduce cost and improve the adaptability and flexibility of the communication system.

Allowable Subject Matter

9. Claims 1-3 and 5-14 are allowed.

10. The following is an examiner's statement of reasons for allowance.

- The prior art fails to teach an apparatus of Claims 1, 7 and 10 that specifically comprises the following:

  -- The instant application is deemed to be directed to a non-obvious improvement over the admitted prior art of the instant application and the invention patented in Pat. No. US 7,233,772, US 6,693,271 and US 6,545,533. The improvement comprises that "a modulator having a clock

input, wherein the clock input is used to initiate charging and discharging of a capacitor".

Conclusion

11. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

12. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ted M. Wang whose telephone number is 571-272-3053. The examiner can normally be reached on M-F, 7:30 AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chieh Fan can be reached on 571-272-3042. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Ted M Wang/
Primary Examiner, Art Unit 2611